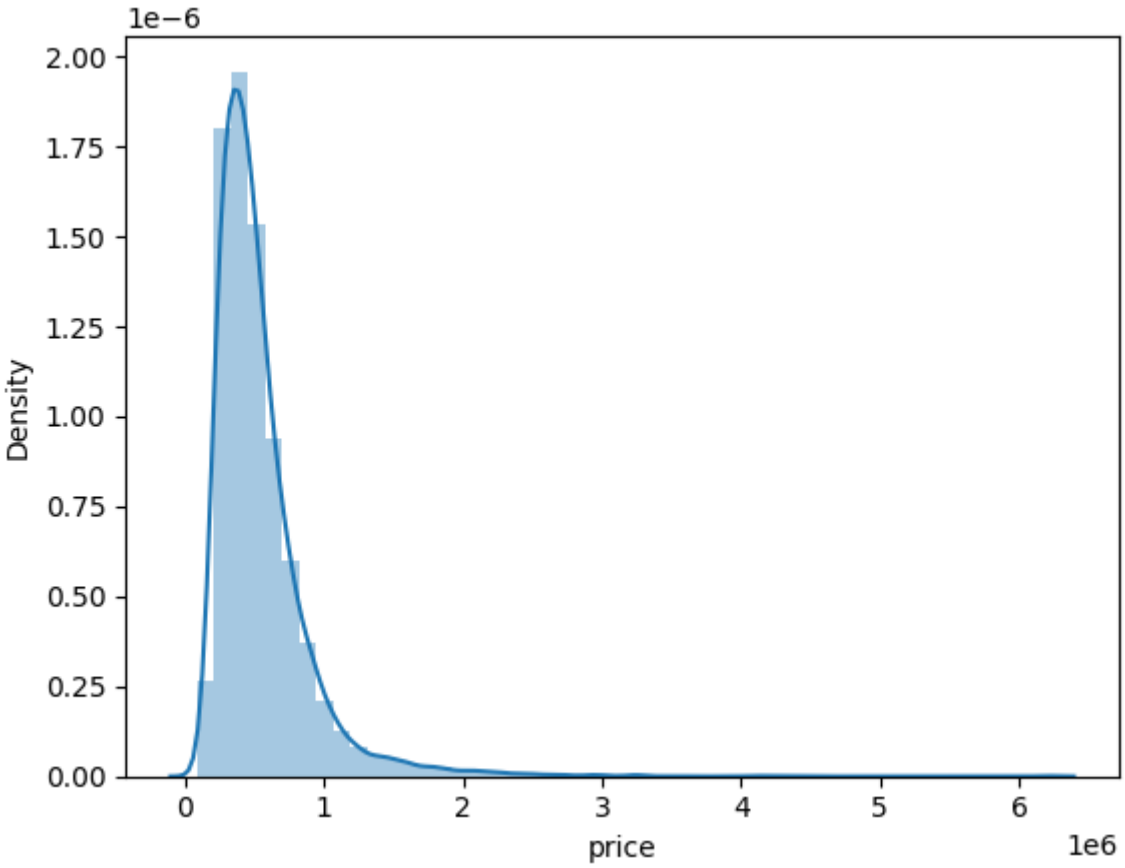
- **Overview-**

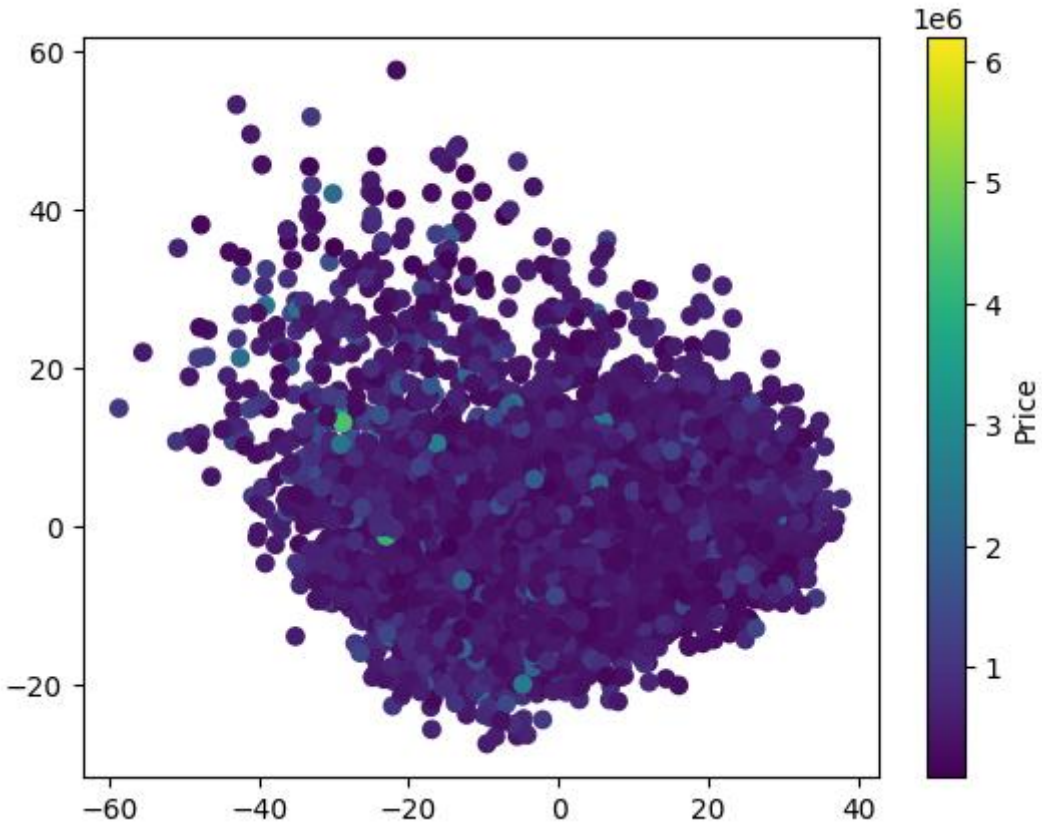
  Step 1: fetching the images from map box static maps, using the lat and long rows given in both the test and train images and saving those images.
  Step 2: Preprocessing, the train dataset to remove any null values and handle outliers, and perform other necessary preprocessing.
  Also the images are also need to be preprocessed so that they can be fed into the resnet50 model .
  Step3:Getting the image embedding , this step is crucial this converts are images into regression ready datapoints , first images are preprocessed so that they can be fed to our cnn model (TRANSFER LEARNING).
  Then these embedding are reduced from 2048 components to 50 components so that noise can be decreased.
  Step4:Finale, now the image embedding along side with other tabular features are used to train our xgb regressor and predict the prices for house .

- **EDA-**

  Some sample images-

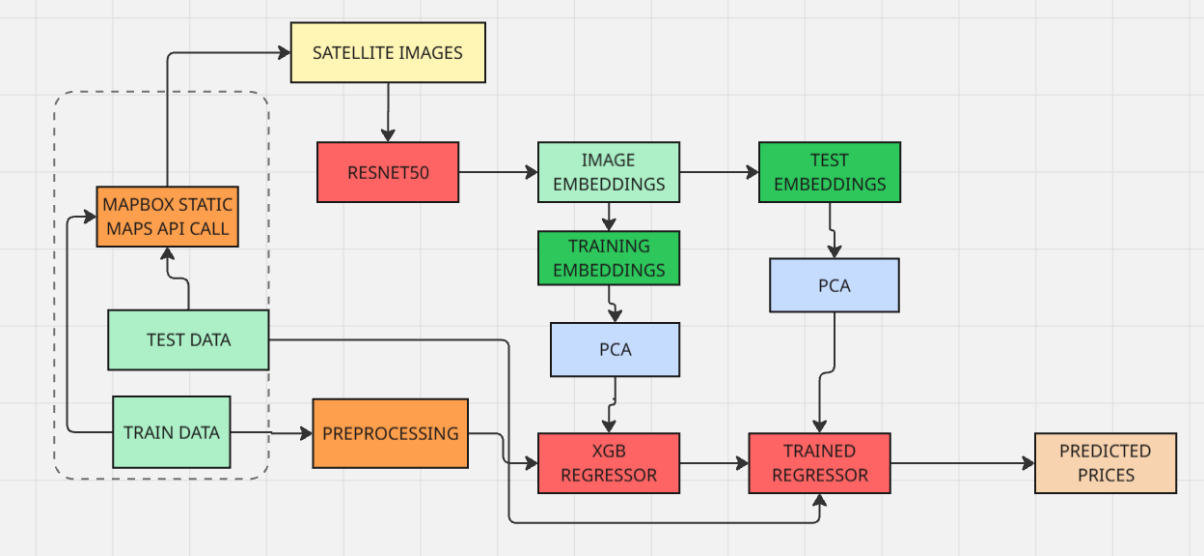
  Price distribution –
  Below graph is the price distribution of the predicted price of our test dataset,showing that prices are skewed.


1e−6
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Density
0
1
2
3
4
5
6
price
1e6


1e6
60
40
20
0
−20
−60
−40
−20
0
20
40
6
5
4
3
2
1
Price

Above graph is the scatter plot of the image embedding reduced to 2 components through this graph we can see that the **price distribution is smooth** (which should be as a locality will have similar housing prices)

- **Architecture diagram-**



- **Results-**

When training on only tabular data we get (xgb regressor):-

```
r2_score:  0.86652183532714 84
rmse score:  120310.2974811383
```

When training on tabular+image data we get(xgb regressor):

```
r2 score:  0.868109941482544
rmse score:  119592.41286971343
```

NOTE!!!
There isn't a drastic increase in the r2_score when we use both tabular and image data , but if we use linear regression instead of the xgb regressor we would see a larger increase in r2_score.
Reason for this is that the xgb regressor is tree based and is susceptible to noise in the dataset(to reduce noise we did pca and reduced images to 50 components) and the dataset is quite small to compensate for it.

```
r2_score:  0.7194170853993144
```

```
r2 score:  0.7318572142990416
```